CLAIMS

1.   A system for controlling display cells modulating light based on data, the system comprising:

an input controller configured to receive a series of data groups with each having N bits and arranged in subgroups, each subgroup having a subgroup value and a subgroup position with each position corresponding to one cell of a group of cells, to determine a comparison value for each subgroup position based on subgroup values at corresponding subgroup positions of a current data group and a preceding data group, to provide an update signal based on the comparison values, and to provide an update data group having less than N bits and representative of the current data group when the update signal indicates reduced data transmission; and

a display controller configured to receive the update signal and the update data group and to update the group of cells based on the update signal with N bits of data from at least one of:

the update data group;

the preceding data group; and

a function of the update and preceding data groups.

2.   The system of claim 1, wherein the preceding data group is a data group immediately preceding the current data group in the series of data groups.

3.   The system of claim 1, wherein the input controller further comprises:
a memory storing the preceding image data group.

4.   The system of claim 1, wherein the display controller further comprises:
a memory storing the preceding image data group.

5.   The system of claim 1, wherein each data group comprises a row of image data representative of a displayable image, wherein the group of cells comprises a row of light modulating cells of a light modulating array, and wherein each subgroup of the row of image data corresponds to one light modulating cell of the row of light modulating cells.

6.   The system of claim 5, wherein the comparison value of a subgroup position of a current row of image data is based on a comparison of the subgroup value of the subgroup position of the current row of image data to a subgroup value at a corresponding subgroup position of a preceding row of image data.

7.   The system of claim 6, wherein the update signal indicates which subgroup positions of a current row of image data have subgroup values that match and which subgroup positions have subgroup values that do not match the subgroup value of the corresponding subgroup position of the preceding row of image data.

8.   The system of claim 7, wherein the update signal comprises:
        a status bit corresponding to each subgroup position of the current row of data, wherein each bit has a first state indicating when the associated subgroup value does not match and a second state when the associated subgroup value does matches the subgroup value at the corresponding subgroup position of the preceding row of image data.

9.   The system of claim 7, wherein the update data group comprises:
        subgroups of the current row of image data having subgroup values that do not match the subgroup values of corresponding subgroup positions of the preceding row of image data.

10.   The system of claim 9, wherein the display controller, when an update signal status bit has the first state, provides a subgroup from the update data

group having a same subgroup position as the status bit to a corresponding light modulating cell of a row of cells, and when an update signal status bit has the second state, provides a subgroup of the preceding row of image data having a same subgroup position as the status bit to a corresponding light modulating cell of the row of cells.

11. The system of claim 5, wherein the comparison value of each subgroup position of a current row of image data comprises a difference value between the subgroup value of the subgroup position of the current row of image data and a subgroup value at a corresponding subgroup position of a preceding row of image data.

12. The system of claim 11, wherein the update signal indicates which subgroup positions of a current row of image data have an associated difference value having an absolute value at least equal to a predetermined threshold difference value, and which subgroup positions have an associated difference value less than the predetermined threshold difference value.

13. The system of claim 12, wherein the update signal comprises:
a status bit corresponding to each subgroup position of the current row of data, wherein each bit has a first state indicating when the associated difference value has an absolute value at least equal to the predetermined threshold difference value and a second state indicating when the associated difference value has an absolute value less than the predetermined threshold difference value.

14. The system of claim 12, wherein the update data group comprises:
subgroups of the current row of image data having an associated difference values with absolute values at least equal to the threshold difference value, and the difference values of subgroups wherein the absolute value of the difference value is less than the predetermined threshold difference value.

15.   The system of claim 14, wherein the display controller, when an update signal status bit has the first state, provides a subgroup from the update data group having a same subgroup position as the status bit to a corresponding light modulating cell of a row of cells, and when an update signal status bit has the second state, provides a subgroup comprising a sum of a difference value from the update data group and a subgroup from the preceding row of image data having a same subgroup position as the status bit to a corresponding light modulating cell of the row of cells.

16.   The system of claim 1, wherein each data group comprises a frame of image data representative of a displayable image, wherein the group of cells comprises an array of light modulating cells, and wherein each subgroup of the frame of image data corresponds to one light modulating cell of the array of light modulating cells.

17.   The system of claim 16, wherein the comparison value of a subgroup position of a current frame of image data is based on a comparison of the subgroup value of the subgroup position of the current frame of image data to a subgroup value at a corresponding subgroup position of a preceding frame of image data.

18.   The system of claim 17, wherein the update signal has a first state when a percentage of a total number of subgroup positions of the current frame of image data having subgroup values not matching subgroup values of corresponding subgroup positions of a preceding frame of image data is not greater than a predetermined threshold percentage, and a second state when the percentage exceeds the predetermined threshold percentage.

19.   The system of claim 18, wherein the update data group comprises:
        the current frame of image data when the update signal has the first state, and a quantity of representative subgroups less than the number of subgroup positions of the current frame of image data and having subgroup

values based on the subgroup values of the current fame of image data when the update signal has the second state.

20.   The system of claim 19, wherein each of the representative subgroups of the update data group has a subgroup value comprising an average of the subgroup values of a corresponding predetermined group of subgroup positions of the current frame of image data.

21.   The system of claim 19, wherein each of the representative subgroups of the update data group has a subgroup value comprising the subgroup value of a predetermined subgroup position of the current frame of image data.

22.   The system of claim 19, wherein the display controller provides each subgroup of the current frame of data to the corresponding light modulating cell of the light modulating array when the update signal has the first state, and provides each of the representative subgroups to at least two of the light modulating cells of the light modulating array.

23.   A display system comprising:
        a display having cells modulating light based on data;
        an input controller configured to receive a series of data groups with each having N bits and arranged in subgroups, each subgroup having a subgroup value and a subgroup position with each position corresponding to one cell of a group of cells, to determine a comparison value for each subgroup position based on subgroup values at corresponding subgroup positions of a current data group and a preceding data group, to provide an update signal based on the comparison values, and to provide an update data group having less than N bits and representative of the current data group when the update signal indicates reduced data transmission; and
        a display controller configured to receive the update signal and the update data group and to update the group of cells based on the update signal with N bits of data from at least one of:

the update data group;

the preceding data group; and

a function of the update and preceding data groups.

24.   A system for controlling a display having cells modulating light based on image data, the system comprising:

an input controller configured to receive a series of image data groups with each image data group having N subgroups, each subgroup having a subgroup position and a subgroup value, with each subgroup position corresponding to one cell of a group of N cells, to provide an update signal indicating which subgroup positions of a current image data group have subgroup values that substantially match subgroup values at corresponding subgroup positions of a preceding image data group, and to provide an update image data group based on subgroups of the current image data group having subgroup values not substantially matching subgroup values at corresponding subgroup positions of the preceding image data group; and

a display controller configured to receive the update signal and the update image data group and to update the group of N cells with N subgroups each comprising image data from the update and/or preceding image data groups based on the update signal.

25.   The system of claim 24, wherein the preceding data group is a data group immediately preceding the current data group in the series of data groups.

26.   The system of claim 24, wherein the input controller further comprises:

a memory storing the preceding image data group.

27.   The system of claim 24, wherein the display controller further comprises:

a memory storing the preceding image data group.

28. The system of claim 24, wherein each data group comprises a row of image data representative of a displayable image, wherein the group of N cells comprises a row of light modulating cells of a light modulating array, and wherein each of the N subgroups of the row of image data corresponds to one light modulating cell of the row of N light modulating cells.

29. The system of claim 28, wherein the comparison value of a subgroup position of a current row of image data is based on a comparison of the subgroup value of the subgroup position of the current row of image data to a subgroup value at a corresponding subgroup position of a preceding row of image data.

30. The system of claim 29, wherein the update signal indicates which subgroup positions of a current row of image data have subgroup values that match and which subgroup positions have subgroup values that do not match the subgroup value of the corresponding subgroup position of the preceding row of image data.

31. The system of claim 30, wherein the update signal comprises:
a status bit corresponding to each subgroup position of the current row of image data, wherein each bit has a first state indicating when the associated subgroup value does not match and a second state when the associated subgroup value does matches the subgroup value at the corresponding subgroup position of the preceding row of image data.

32. The system of claim 30, wherein the update data group comprises:
subgroups of the current row of image data having subgroup values that do not match the subgroup values of corresponding subgroup positions of the preceding row of image data.

33. The system of claim 32, wherein the display controller, when an update signal status bit has the first state, provides a subgroup from the update data

group having a same subgroup position as the status bit to a corresponding light
modulating cell of a row of cells, and when an update signal status bit has the
second state, provides a subgroup of the preceding row of image data having a
same subgroup position as the status bit to a corresponding light modulating
cell of the row of cells.

34.   A system for controlling display cells modulating light based on data, the
system comprising:

an input controller configured to receive a series of data groups with each
data group having N subgroups, each subgroup having a subgroup position and
a subgroup value, with each subgroup position corresponding to one cell of a
group of N cells, to determine difference values between subgroup values of a
current data group and subgroup values at corresponding subgroup positions of
a preceding data group, to provide an update signal indicating subgroup
positions at which difference values are below a threshold value, and to provide
update data comprising subgroups from subgroup positions of the current data
group at which difference values at least equal the threshold value and the
difference values when less than the threshold level; and

a display controller configured to receive the update signal and the
update data, and to update the group of N cells with N subgroups each
comprising data from the update data and/or preceding data group based on the
update signal.

35.   The system of claim 34, wherein the preceding data group is a data
group immediately preceding the current data group in the series of data
groups.

36.   The system of claim 34, wherein the input controller further comprises:
        a memory storing the preceding image data group.

37.   The system of claim 34, wherein the display controller further comprises:
        a memory storing the preceding image data group.

38.   The system of claim 34, wherein each data group comprises a row of image data representative of a displayable image, wherein the group of cells comprises a row of light modulating cells of a light modulating array, and wherein each subgroup of the row of image data corresponds to one light modulating cell of the row of light modulating cells.

39.   The system of claim 38, wherein the comparison value of each subgroup position of a current row of image data comprises a difference value between the subgroup value of the subgroup position of the current row of image data and a subgroup value at a corresponding subgroup position of a preceding row of image data.

40.   The system of claim 39, wherein the update signal indicates which subgroup positions of a current row of image data have an associated difference value having an absolute value at least equal to a predetermined threshold difference value, and which subgroup positions have an associated difference value less than the predetermined threshold difference value.

41.   The system of claim 40, wherein the update signal comprises:
       a status bit corresponding to each subgroup position of the current row of data, wherein each bit has a first state indicating when the associated difference value has an absolute value at least equal to the predetermined threshold difference value and a second state indicating when the associated difference value has an absolute value less than the predetermined threshold difference value.

42.   The system of claim 40, wherein the update data group comprises:
       subgroups of the current row of image data having an associated difference values with absolute values at least equal to the threshold difference value, and the difference values of subgroups wherein the absolute value of the difference value is less than the predetermined threshold difference value.

43.   The system of claim 42, wherein the display controller, when an update signal status bit has the first state, provides a subgroup from the update data group having a same subgroup position as the status bit to a corresponding light modulating cell of a row of cells, and when an update signal status bit has the second state, provides a subgroup comprising a sum of a difference value from the update data group and a subgroup from the preceding row of image data having a same subgroup position as the status bit to a corresponding light modulating cell of the row of cells.

44.   A system for controlling a display having cells modulating light based on data, the system comprising:

an input controller configured to receive a series of data groups with each data group having N subgroups, each subgroup having a subgroup position and a subgroup value, with each subgroup position corresponding to one cell of a group of N cells; to provide an update signal having a first state when a percentage of N subgroup positions of a current data group having values not matching subgroup values at corresponding subgroup positions of a preceding data group exceeds a threshold percentage, and when the update signal has the first state to provide an update data group having less than N subgroups having subgroup values based on the current data group; and

a display controller configured to receive the update signal and the update data group and to update the group of N cells with the update data group such that at least one subgroup is provided to more than one of the N cells when the update signal has the first state.

45.   The system of claim 44, wherein the preceding data group comprises a data group immediately preceding the current data group in the series of data groups.

46.   The system of claim 44, wherein the input controller further comprises:
a memory storing the preceding image data group.

47.   The system of claim 44, wherein each data group comprises a frame of image data representative of a displayable image, wherein the group of N cells comprises an array of light modulating cells, and wherein each of the N subgroups of the frame of image data corresponds to one light modulating cell of the array of N light modulating cells.

48.   The system of claim 47, wherein the comparison value of a subgroup position of a current frame of image data is based on a comparison of the subgroup value of the subgroup position of the current frame of image data to a subgroup value at a corresponding subgroup position of a preceding frame of image data.

49.   The system of claim 48, wherein the update signal has a first state when a percentage of the N subgroup positions of the current frame of image data having subgroup values not matching subgroup values of corresponding subgroup positions of a preceding frame of image data is not greater than a predetermined threshold percentage, and a second state when the percentage exceeds the predetermined threshold percentage.

50.   The system of claim 49, wherein the update data group comprises:
       the current frame of image data when the update signal has the first state, and a quantity of representative subgroups less than the N subgroup positions of the current frame of image data and having subgroup values based on the subgroup values of the current fame of image data when the update signal has the second state.

51.   The system of claim 50, wherein each of the representative subgroups of the update data group has a subgroup value comprising an average of the subgroup values of a corresponding predetermined group of subgroup positions of the current frame of image data.

52.   The system of claim 50, wherein each of the representative subgroups of the update data group has a subgroup value comprising the subgroup value of a predetermined subgroup position of the current frame of image data.

53.   The system of claim 50, wherein the display controller provides each subgroup of the current frame of data to the corresponding light modulating cell of the light modulating array when the update signal has the first state, and provides each of the representative subgroups to at least two of the light modulating cells of the light modulating array when the update signal has the second state.

54.   A method of reducing data rates to a display device having display cells modulating light based on image data, the method comprising:

    receiving a series of image data groups, with each image data group having N bits arranged in subgroups, each subgroup having a subgroup value and a subgroup position, with each subgroup position corresponding to one cell of a group of cells;

    determining a comparison value for each subgroup position based on subgroup values of corresponding subgroup positions of a current image data group and a preceding image data group;

    providing to the display device an update signal based on the comparison values; and

    providing to the display device an update image data group having less than N bits and representative of the current image data group when the update signal indicates reduced data transmission.

55.   The method of claim 54, further comprising:

    updating the group of cells based on the update signal with N bits of data from at least one of:

        the update image data group;

        the preceding image data group; and

        a function of the update and preceding image data groups.

56.   A method of reducing data rates to a display device having cells modulating light based on image data, the method comprising:

receiving a series of image data groups with each image data group having N subgroups, each subgroup having a subgroup position and a subgroup value, with each subgroup position corresponding to one cell of a group of N cells; and

providing to the display device an update image data group having subgroups comprising only those subgroups of a current image data group having subgroup values not matching subgroup values at corresponding subgroup positions of a preceding image data group.

57.   The method of claim 56, further comprising:

providing to the display device an update signal indicating subgroup positions of the current image data group at which subgroup values match and subgroup positions of the current image data group at which subgroup value do not match subgroup values at corresponding subgroup positions of the preceding image data group.

58.   The method of claim 57, further comprising:

updating each cell of the group of N cells with a corresponding subgroup of the update image data group or the preceding image data group based on the update signal.

59.   A method of reducing data rates to a display device having cells modulating light based on image data, the method comprising:

receiving a series of image data groups with each image data group having N subgroups, each subgroup having a subgroup position and a subgroup value, with each subgroup position corresponding to one cell of a group of N cells;

determining a difference value between each subgroup value of a current image data group and a subgroup value at a corresponding subgroup position of a preceding image data group;

providing to the display device an update image data group comprising subgroups of the current image data group from subgroup positions at which the difference value has an absolute value at least equal to a threshold value and difference values only from subgroup positions at which the difference value has an absolute value less than the threshold value.

60. The method of claim 59, further comprising

providing to the display device an update signal indicating which subgroup positions of the current image data group have a difference value with an absolute value at least equal to the threshold value and which subgroup positions of the current image data group have a difference value with an absolute value less than the threshold value.

61. The method of claim 60, further comprising:

updating each cell of the group of N cells with N subgroups each comprising image data from the update image data group and/or the preceding data group based on the update signal.

62. A method of reducing data rates to a display device having cells modulating light based on image data, the method comprising:

receiving a series of image data groups with each image data group having N subgroups, each subgroup having a subgroup position and a subgroup value, with each subgroup position corresponding to one cell of a group of N cells;

determining a percentage of subgroup values of the current image data group not matching a corresponding subgroup value of a preceding image data group; and

providing to the display device an update image data group comprising:

less than N subgroups of image data when the percentage exceeds a threshold percentage, wherein each of the less than N subgroups of image data has a subgroup value based on the subgroup values of the current image data group, and

the N subgroups of the current image data group when the percentage is not greater than the threshold percentage.

63.　　The method of claim 62, further comprising:

providing to the display device an update signal having a first state when the percentage is not greater than the threshold percentage and a second state when the percentage exceeds the threshold percentage.

64.　　The method of claim 63, further comprising:

updating each cell of the group of N cells with the corresponding subgroup of the update image data group when the update signal is at the first state, and updating the cells of the group of N cells with the less than N subgroups of the update image data group when the update signal is at the second state, wherein each of the less than N subgroups is provided to more than one cell of the group of N cells.

65.　　A portable electronic device comprising:

display cells modulating light based on data; and

the system of claim 1 for controlling the display cells.

66.　　A notebook computer comprising:

display cells modulating light based on data; and

the system of claim 1 for controlling the display cells.

67.　　A cell phone comprising:

a projector having display cells modulating light based on data; and

the system of claim 1 for controlling the display cells.

68. A handheld electronic device comprising:
   a projector having display cells modulating light based on data;
   the system of claim 1 for controlling the display cells.

69. An electronic device comprising:
   a removable display module including:
      display cells modulating light based on data; and
      the system of claim 1 for controlling the display cells.

70. An input controller adapted to couple to an array system having display cells modulating light based on data, the input controller configured to receive a series of data groups with each having N bits arranged in subgroups, each subgroup having a subgroup value and a subgroup position with each position corresponding to one display cell of a group of display cells, to determine a comparison value for each subgroup position based on subgroup values at corresponding subgroup positions of a current data group and a preceding data group, to provide an update signal based on the comparison values, and to provide an update data group having less than N bits and representative of the current data group when the update signal indicates reduced data transmission.

71. The input controller of claim 70, wherein the preceding data group is a data group immediately preceding the current data group in the series of data groups.

72. The input controller of claim 70 further comprising a memory for storing the preceding data group.

73. The input controller of claim 70, wherein each data group comprises a row of image data representative of a displayable image, wherein the group of cells comprises a row of light modulating cells of a light modulating array, and wherein each subgroup of the row of image data corresponds to one light modulating cell of the row of light modulating cells.

74.   The input controller of claim 71, wherein the comparison value of a subgroup position of a current row of image data is based on a comparison of the subgroup value of the subgroup position of the current row of image data to a subgroup value at a corresponding subgroup position of a preceding row of image data.

75.   The input controller of claim 71, wherein the comparison value of each subgroup of a current row of image data comprises a difference value between the subgroup value of the subgroup position of the current row of image data and a subgroup value at a corresponding subgroup position of a preceding row of image data.

76.   The input controller of claim 70, wherein each data group comprises a frame of image data representative of a displayable image, wherein the group of cells comprises an array of light modulating cells, and wherein each subgroup of the frame of image data corresponds to one light modulating cell of the array of light modulating cells.

77.   An array system comprising:
       display cells modulating light based on data; and
       a display controller configured to receive an update signal and an update data group, wherein the update signal is based on comparison values derived from subgroup values at subgroup group positions of a current data group of a series of data groups and subgroup values at corresponding subgroup positions of a preceding data group of the series with each data group of the series having N bits arranged in subgroups and each subgroup having a subgroup value and a subgroup position corresponding to one display cell of a group of display cells and wherein the update data group has less than N bits is representative of the current data group when the update signal indicates reduced data transmission, and configured to update the group of display cells based on the update signal with N bits from at least one of:

the update data group;

the preceding data group; and

a function of the update and preceding data groups.

78.   The array system of claim 77 further comprising a memory for storing the preceding data group.